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# THE MARINE BIOLOGICAL LABORATORY AT SAN PEDRO

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As it is the aim of our Historical Society to collect and preserve data in regard to any important event or undertaking in Southern California, a brief sketch of the Marine Biological Laboratory at San Pedro will be given. Of the necessity for such a zoological station in Southern California there can hardly be a doubt. Whether this beginning may be only a temporary effort that cannot serve many summers, or whether it is the nucleus of an immense zoological station, like the Stazione Zoologica, that stands along the water front of the city of Naples, who can tell?

That this is the desire of the founders of the marine laboratory, there is no doubt. The fiulfillment depends upon monetary considerations.

During the latter half of the past century scientific researches added a new glory to the sea. Science had emphasized the fact that "Omne vivum ex vivo," "all life" came "from life," but investigation added a new truth that has revolutionized the study of life. The evolution of life from a one-celled form gives a new significance to the study of marine life. The ocean as the first cradle of humanity assumes a new dignity. The animals of the sea no longer remain as segregated forms, having no close kinship, but are studied as possible links in the chain of organic life. The study of comparative anatomy and physiology has become a necessity, for these marine forms show some of the variations that life assumed before man was evolved from the earlier protoplasmic cell. Although the morphology of oceanic life is of recent date the interest in scientific research is becoming universal. At a comparatively short time ago there was but one marine biological laboratory in the United States. Now these zoological laboratories, or experiment stations, are a marked feature in courses of study required by universities.

On the Pacific shore the Leland Stanford, Jr., University has its marine biological laboratory at Pacific Grove, and the summer school of marine biology at San Pedro has been started by the zoological department of the State University at Berkeley.

An important undertaking represents the growth of an idea expressed in action. Tentative trials often precede work of greater significance. There are several links in the development of the marine biological laboratory at San Pedro. One link in the chain of events was begun in the summer of 1891 at Pacific Grove. In the summer of 1893 investigation was carried on at Avalon for about one month. In the summer of 1895 a party was located at Timm's Point, in San Pedro Bay. This preliminary work had been carried on under the supervision of Prof. William E. Ritter, now at the head of the Department of Zoology at Berkeley. In the summer of 1899 Prof. Ritter was with the Harriman party in Alaska and had charge of the marine vertebrate work.

The undertaking at San Pedro is the expression of Prof. Ritter's hope for a permanent station in Southern California. On the 15th of May of this year (1901) the gasoline launch Elsie was hired for the purpose of dredging. The Duffy bathhouse on Terminal Island—locally known as East San Pedro—was leased for the use of the laboratory. This bathhouse, situated on the breakwater of San Pedro Bay, was prepared for the use of the summer school, under the immediate supervision of Prof. Ritter. In June the bathhouse was ready for occupancy. The building, facing the inner harbor of the bay, stands a long, white, one-story structure containing seven little rooms,, a small room for laboratory stores and a long room for the use of the summer classes. In this room each student had the use of a window above the long tables, fitted out for the accommodation of about fifteen pupils. On the outside of these windows, of which there are nine, on the channel side, each one is covered with a white tent awning. The row of little rooms referred to was for the use of Prof. Ritter and his corps of teachers, the library, and for the use of specialists. Fresh water and water from the bay was piped into the room.

The library and equipments were brought from the north. The use of aquarium facilities, glassware, reagents, microscopes and books were furnished the pupils, but not dissecting instruments, paper, etc.

The following were in charge: Prof. Wm. E. Ritter, Assistant Professor W. J. Raymond, Hydrography; Assistant Professor C. A. Kofoid, Zoology; Dr. F. W. Bancroft, Physiology, and Mr. H. B. Torrey, Zoology. Among the specialists present from Eastern colleges were Prof. Wesley Coe of Yale, Prof. Samuel J. Holmes of Michigan University, and Prof. T. D. A. Cockerell of the State Normal School at Los Vegas, New Mexico.

Lectures were delivered on an average of about twice a week during the term. They were given in the evening, and with one exception,—when one of the ladies on the island gave the use of her summer cottage,—they were delivered in the class room of the school. The following list of topics will give an idea of the scope of these lectures:

"The Ocean as a Habitat of Living Beings:" Prof. William E. Ritter. (July 3.)

"A Sketch of the History and Methods of Marine Biological Exploration:" Dr. C. A. Kofoid. (July 5).

"Geographical Distribution of Terrestrial Animals in the West:" Prof. T. D. A. Cockerell. (July 12).

"The Habits of Amphepod Crustacea:" Dr. S. J. Holmes. (July 12).

"Some Problems of Regeneration:" Mr. H. B. Torrey. July 16).

"Locomotion of Marine Animals:" Dr. Frank W. Bancroft. (July 18).

"Biological Exploration:" Prof. William E. Ritter. (July 26).

"The Study of Variation:" Dr. F. W. Bancroft. (Aug. 1).

"Distribution of Mollusca on the Pacific Coast of North America:" Dr. William H. Dall. (Aug. 5).

"Phototaxis:" Dr. S. J. Holmes. (Aug. 6).

One of the lecturers in this course was Dr. William H. Dall of the Smithsonian Institution, who was a visitor at the Marine Station for a few days.

Dr. F. W. Bancroft and Mr. H. B. Torrey, who had immediate supervision of the class work, were untiring in their efforts to assist students in their departments. Five, and more often six, days in each week, from June 27, to August 7, were covered by the course of instruction. Occasionally students went out with the dredging launch Elsie. Little parties also made early morning excursions in quest of marine invertebrates for class work.

As we all know, it was during the session of the school that the wonderful phosphorescence appeared on our Southern waters. The presence of the peridinium, the cause of the luminosity of the ocean, added to the interest of the class-room, and caused thousands of persons to visit the various beaches.

On the evening of July 11, 1901, Prof. W.R. Raymond asked the writer if she had noticed a peculiar light, or phosphorescence, in the bay on the ocean side. He had remarked its presence in the channel. That evening the phosphorencence was plainly visible on the ocean side of the bay, and each evening after, for several days the peculiar light was intensified in brilliancy, and the illumination increased in area. During the rest of the month of July and the first week in August this display of phosphorescence continued. During this time it was visible, with varying degrees of luminosity, from Santa Barbara, Ventura, Santa Monica, Redondo, San Pedro Bay, including Long Beach and down the coast to Coronado and San Diego.

At the cove, on Terminal Island, when the waves dashed high and immense breakers rolled in, each billow was capped by a blaze of light that broke against the rocks or lost itself in a spreading sheet of glimmering undulations. A pail of this water gently stirred in a dark room was brilliantly starred with tiny lights, and a scintillating mass of light followed a more vigorous agitation of the water. Any object, like a hand, immersed in the pail was covered with little sparks, as of fire, when it was removed from the water.

Rowing in a skiff over the water at night, one could plainly see fishes darting away from their enemies, sharks and stingrays in search of prey. The movemest of the boat caused a brilliant display of phosphorescence on either side of it, and the splash of the paddle was like playing with burning brimstone.

Over the ocean the crest of the waves shone with a brilliant flame, and the light merged into a glistening, yellowish-green illumination that died away in a fringe of red.

In the daytime the ocean was of a red or reddish-brown color.

On Sunday morning, July 21, we were conscious that there was some unusual condition of affairs on the beach at the cove. The sea-gulls were flying in flocks, or quacking in groups on the wet sand at the water's edge, and the beach was strewn with squirming and flopping young stingrays, which the gulls eagerly devoured. While on the sand, on the breakwater side, the beach was covered by dead fish. In a short space of time Mr. Torrey and Miss Robertson of the laboratory had collected almost a dozen different species of fish in a small area on the sand. These fishes included flat sharks, stingrays, edible fishes, and several devil-fish or octopi; hundreds of sea cucumbers and thousands of small crabs were also lying lifeless on the wet sand.

Some of these were too far gone for laboratory use, but some of them were opened to see what could be the cause of this wholesale destruction of life. The gills of the fishes were studied to see if they contained many of the peridinium,—which were now dying in immense quantities,—and the stomachs of the fishes were dissected for the same purpose. When the peridinums were dying and dead, the odor from the ocean was unbearable, and even enthusiasts, who are supposed to be oblivious of rank odors, were annoyed and enervated by the rank odor wafted by the sea breeze.

For days these little protozoas had been the subject of much study in the laboratory. The peridinums appeared to keep together in flocks or colonies. In a glass tube these microscopic animals could be seen moving as a flock of birds might move, some leading, others following. Their appearance, as a whole, was that of a light, yellow-brown gelatinous looking substance, passing upward in a glass of water. Even in a tube, their gregarious nature was visible.

Although the season of the summer school at the Biological Station was such a success, everyone knows this was only of secondary importance. The real object in locating the Biological Station in San Pedro Bay was on account of the rich faunæ of the San Pedro region, Santa Catalina region and that of San Diego Bay. To make hydrographic investigations, including a study of the temperature and salinity of the waters, currents and tides, exploring from 100 to 150 fathoms, and collecting at various depths the rare and new specimens sure to be found in these rich areas—these were of first importance. The results more than equaled the expectation. Eighty-six stations were dredged, and 157 hauls were made. Several (12) barrels of valuable material was secured for the University at Berkeley. Common species were placed in the station for school use, but the rarer specimens were reserved for the State University. The dredging was under the supervision of Dr. C. A. Kofoid, recently from Berkeley, but formerly from Champlain, Ill. He and his corps of assistants—Dr. C. A. Whiting of Los Angeles, Mr. Cook of Whittier, and others—dredged in the vicinity of San Diego for nearly three weeks. In the San Diego region there is a deep depression or cañon, and dredging in this deep gorge descended to over 630 fathoms. The hydrography of the Catalina and San Pedro regions was in charge of Prof. W. R. Raymond, who had also the work of determining the molluscan species. In this he was very ably assisted by Mrs. T. S. Oldroyd. This meant the sorting out and classifiying of immense quantities of drift material, rich in molluscan life.

All material collected was, after sorting out species, or genera, tied in little cheese-cloth bags, containing labels of the station from which each specimen was collected, then these bags were packed in barrels in alcohol. Small or very rare specimens were placed in vials or bottles containing alcohol. Miss Robertson of Berkeley had charge of the material temporarily left at the Biological Laboratory. Miss Gulilema R. Crocker sorted and identified the echinoderms; Prof. Wesley R. Coe of Yale had charge of the nemertina, (worms), making drawings and naming a number of new species, and Dr. S. J. Holmes of Michigan University had supervision of new forms of crustacea. Besides these, there were a number of persons engaged in special study of various branches. Diatoms, Dr. W. C. Adler-Muschkowsky; Peridiniums, Mr. H. B. Torrey; Echinoderms in connection with the reproduction of rays, Miss Monks; Bryozoa, Miss Robertson; Ascidians, Dr. Bancroft; Enteropneusta, Prof. Rtiter; Sea Slugs, Prof. Cockerell.

Although the university's endowment is capitalized at about "eleven million dollars," and its yearly income is about "five hundred thousand dollars," and it has received "private benefactions to the amount of four million dollars," there does not seem to have been any adequate sum set apart for research in Southern California. Capitalists in Los Angeles were appealed to, and they responded, as the following note of acknowledgement, issued in the University Bulletin of April, 1901, attests. After this was issued, other friends of the enterprise in Los Angeles responded. These are now added to the other names:

"The investigations here projected are made possible, financially by the co-operation with the university of Mr. H. W. O'Melveny, Mr. J. A. Graves, Mr. Jacob Baruch, Mr. Wm. G. Kerckhoff, Mr. Wm. R. Rowland, the Los Angeles Terminal Railway, Mr. J. H. Shankland, Mr. Jno. E. Plater, and the Banning Company," Mr. I. N. Van Nuys, Mr. C. M. Wright, Mr. H. Newmark, Mr. H. Jevne, Miss M. M. Fette, Mr. H. H. Kerckhoff, Mr. R. H. F. Variel, Mr. W. J. Variel, Mr. L. R. Hewitt, Mr. Russ Avery, E. K. Wood Lumber Co., Standard Oil Company, all of Los Angeles.